Wm. Marriott, secretary, Royal Meteorological Society, London, January 23, 1914:

The publication of such a map is a great advance in meteorology and will help us to understand better many of the problems of the general circulation of the atmosphere.

R. Siedek, Central Hydrographic Office, Vienna, January 29, 1914:

The K. k. hydrographische Zentral Bureau most heartily welcomes the new daily weather map of the Northern Hemisphere, published by the United States Weather Bureau.

W. H. Hammon, formerly district forecaster at San Francisco:

I have your new map of the Northern Hemisphere on the reverse side of the morning weather map. I think this is the most valuable scientific step taken by the Weather Bureau in many years, and I believe very valuable results will ensue. * * * When I was in California I made a series of daily weather maps of the Pacific Ocean from the hydrographic reports and drew the best lines I could. I believe this information was extremely valuable in perfecting the system of forecasts which we followed in California. This series of maps was among the serious losses that resulted from the San Francisco fire [April, 1906].

C. Hart Merriam, executive of the "Harriman Trust Fund":

Your new departure in printing the Northern Hemisphere weather map on the back of the United States weather map is a great advance, and I congratulate you on having brought this about.

Prof. Ellsworth Huntington, Yale University:

The idea of giving a general map of the entire Northern Hemisphere is extremely useful. * * * For the nonscientific man who is interested in the weather they are sure to prove educational. * * *

Prof. Dr. Felix Exner, K. k. Universität Innsbruck. March 4, 1914:

* * * A copy of the International Map for the Northern Hemisphere for January 1, 1914, has come to my Institute, and I admired very much this great progress in weather maps.

THE WEATHER MAP ON THE POLAR PROJECTION.

One can not examine a series of the new daily weather maps of the Northern Hemisphere without realizing that this publication is destined to throw great light on the motions of our atmosphere and on the periodic as well as the quasi-periodic and the irregular changes of our weather and storms. Especially does it renew that stimulus to the study of the mechanics of the earth's atmosphere, which was first given by the memoirs of William Ferrel. His study of 1858–1860, which he began in 1856 as a popular essay, was reprinted as Professional Paper of the U. S. Signal Service, No. 8, Washington, 1882, with notes by Prof. Frank Waldo. This, together with his many other studies, will always command our admiration, no matter what advances may hereafter be made in the mathematical treatment of atmospheric motions. Ferrel taught us that the diurnal rotation of the earth on its axis, the attraction of gravitation, and the distribution of temperature near the earth's surface, are the three fundamental factors that must be considered. Subsequently he discussed the differences of friction over land and water; the thermodynamics of ascending and descending masses of air; the influence of the distribution of moisture; finally, toward the close of his life, he began the consideration of the influences of radiation and absorption.

So far as we know no one has as yet dared to begin the discussion of the motions of the atmosphere under the combined influences of all these seven factors and yet these must be gathered into one set of systematic equations or graphic charts, if we would fully understand the phenomena shown by the daily weather map. In fact, an eighth factor must be added, viz, the influence of high plateaus and mountain ranges as superadded to the influences of the lower continental surfaces. Eventually we may consider the ninth factor, viz, the influence of viscosity. When we consider the simple hypothetic atmosphere treated of at first by Ferrel, we perceive that the denser portions of the air are thrown toward the Equator by the diurnal centrifugal force, but that there must be a return current toward the pole of the warmer lighter air, thus giving rise to currents and whirls which become either cyclonic or anticyclonic since the attraction of gravitation holds the atmosphere near the surface of a rotating spheroid. These whirls give rise to the areas of high pressure and low pressure of which we usually see from three to a dozen dotting the map of the Northern Hemisphere. Usually we may consider the air flowing toward the pole as warmer, lighter, and rising, while that flowing toward the Equator is colder, drier and descending. Innumerable obstacles start smaller whirls that are scarcely noticed among these general features.

Our polar map of the Northern Hemisphere shows at a glance that our storms and our blizzards, our hot areas and our hurricanes, are due to the interchanges of air between the Torrid Zone and the Arctic region. A dozen such centers of action are sufficient to enable the atmospheres of northern and southern latitudes to maintain steady interchanges of position without any violent actions, just as earthquakes and minor fractures produce minor earthquakes that save our globe from any extreme cataclysms. For instance, some portion of the atmosphere over the North Polar region, being cooled by atmospheric and terrestrial radiations as also by the expansion of moist air against atmospheric pressure, deposits much of its moisture as rain or snow, becomes relatively denser, and is then pushed southward. There is a resulting region of low pressure about which the winds circulate. This area is sometimes nearly circular and at other times much elongated. The elongated trough may extend from Norway to northern Siberia, or from Newfoundland to Norway, or from the north of Alaska to Labrador. In fact, this trough must oscillate all over the Arctic region from day to day and month to month, in a quasi-periodic fashion depending on the sum total of the moments of inertia of the whole atmosphere relative to our polar axis. Our polar and equatorial winds circulate around this trough, and our large storm centers circulate with it around the pole. Hence these storm centers may come upon the United States most unexpectedly from the northwest or southwest, or from the south or southeast. The map of the United States between latitudes 30° and 50° only, gives us no indication of the causes of these irregularities, whereas the map of our whole hemisphere shows at once that they represent whirls in an atmosphere that thereby attempts to maintain a dynamic equilibrium in each hemisphere. It is the excess of continental resistances obtaining in the northern hemisphere over the southern that allows of the interchange of circulations between it and the southern one. It would be utterly wrong to study our moving atmosphere as a problem in statics. A slight disturbance of static equilibrium produces a complete upset of the dynamic equilibrium and from that moment its readjustment becomes the dominating feature of the atmosphere.

Static equilibrium has never existed throughout the atmosphere of our globe. It is only approximated over comparatively small regions, and for short intervals of time. As to dynamic equilibrium Helmholtz has shown that in an ideal frictionless liquid many whirls or vortices may exist side by side but separated by surfaces of discontinuity and without influencing each other's internal motions; but even this case does not refer to the existing earth's atmosphere unless we ignore viscosity and surface friction. Each one of our great vortices has an influence on whatever is near by. An area of low pressure with its center over Iceland, with southerly winds from Ireland northward over Spitzbergen and Nova Zembla, is accompanied by an overflow of air on to an area of high pressure over Siberia; there the air slowly cools and descends from the upper regions of the atmosphere down upon the cold Arctic region, thence it is drawn into the western half of a low-pressure area over Alaska and the Pacific coast and western Canada. Eventually this cool, dry denser air reaches Texas, the Gulf of Mexico, the Tropics as an underflow; after rising as warm moist air above the trade winds, it begins its next slow fall along an inclined plane north and east toward northern Europe. Every area of low pressure and high pressure includes these regions of rising lighter and descending denser air. If there are no resistances between our atmosphere and the exterior space, then its own internal mechanism must be in dynamic equilibrium.

The present problem in meteorology is to trace on our circumpolar map the lines of flow, or so-called atmospheric stream lines, day by day. From them we may argue backward to the lines of pressure or isodynamics, or lines of force; or, vice versa, we may theoretically determine the lines of force and thence derive the lines of flow. The latter study may be contemplated by Prof. Roever in a paper "On the theory of a mechanism for illustrating certain systems of lines of force" (to appear in Bulletin, Mount Weather Observatory, vol. 6, pt. 5). As the analytics is very complex, he treats a simpler problem by mechanical methods. Another attack upon this problem by a method appropriate for the laboratory is suggested in an article on "Comprehensive maps and models of the globe" (Monthly Weather Review, Washington, December, 1907, p. 559–564, with charts.) When we express the dynamic equations in all their complexity and attempt to solve them by analytical methods, we shall undoubtedly have recourse to graphic methods for the integration of complex functions, as illustrated in a paper by Dr. S. D. Killam, of the University of Alberta, to appear in an early number of this Review.

On the other hand, when sufficient data for any date are available for an approximate presentation of the conditions then existing in the upper air, the student will be able to attain precise results for that date by following out the methods of study expounded by Bjerknes in his "Dynamic Meteorology," or in the preliminary studies by his pupil, J. W. Sandström, "On the construction of isobaric charts for high levels in the earth's atmosphere and their dynamic significance." This latter memoir was written by Sandström in 1901, in response to a request from the Editor, in order to elucidate a proper graphic method of utilizing the important series of kite flights at 17 stations carried out by the United States Weather Bureau in the summer and autumn of 1898.

In 1871, which was the first year of the regular forecast work of the Weather Bureau, the present writer was deeply impressed with the conviction that the atmosphere must be studied as a unit and that neither a continent nor an ocean could properly be considered by itself alone. In order to lay the basis for the proper study of the storms of the Northern Hemisphere, and being deeply impressed with the importance of this view, Gen. Albert J. Myer, as the founder of the Signal Service, visited or corresponded with all the important meteorological and hydrographic offices throughout the world. He then attended the International Meteorological Congress at Vienna, September, 1873 (see Weather Bureau Bull. 11, Washington, 1897, p. 257), and asked it to endorse the desirability of his proposed daily simultaneous observations and charts.

The "Bulletin of International Simultaneous Observations" was undoubtedly the finest piece of international coöperation that the world has ever seen; it was published daily for about 10 years, and in a modified form until December, 1889. Of course, the fact that all data from lands and seas were printed in full, exactly one year after date, in tabular form, in both English and metric systems, with accompanying daily charts of the Northern Hemisphere, added enormously to the expense as compared with the present method devised by Professor Marvin, whose chart is made possible by the free use of the modern systems of telegraph, cable, and wireless, so that it can accompany the regular issue of the daily Weather Bureau map on a comparatively large scale.

Not only does the present map of the Northern Hemisphere show approximately the existing relation between pressures and temperatures in dynamic units over the earth's surface, but we also, by comparing the charts day after day, quickly perceive the origin of the geographic relations that had already been empirically deduced, e. g., the seesaw of pressure and temperature between distant regions; the reasons for the existence of the polar low pressure shown by Köppen's methods of reducing upward (see Monthly Weather Review, Washington, 1896, p. 419); the probable success of future attempts at world-wide, long-distance predictions, such as that made for northern India, based on the high-level records of November 17–27 (See Monthly Weather Review, 1896, p. 420.)

We perceive why the axes of the polar troughs must move irregularly about the pole so that the average for long periods of time becomes a nearly stationary polar depression. We perceive that the glacial phenomena and other climatic peculiarities must go through slow stages of change, but without any systematic periodicity. We see how insignificant is the influence of the Japan Current and Gulf Stream on continental climates. The temporary historic changes in climates; the occasional occurrence of a deluge or a great drought; the frequent recurrence of warm or cold, wet or dry years; are all seen to be due to rare combinations of forces, motions, or conditions that can only recur after many ages. We even perceive that while geologic ages have brought about very slow changes in the distribution of altitudes, mountains, continents, and oceans, there must have been equally slow changes in our plants and birds, enabling the latter to learn to travel great distances annually in search of desirable foods and habitats, while our atmosphere itself has continued to maintain its annual interchange between equatorial and polar regions.

The contemplation of this persistent circulation in our atmosphere and the changes that have occurred in the orography of the globe, must impress one profoundly with the conviction that for untold ages the earth has been fit for the home of man and of every form of life. If the study of our new map of the Northern Hemisphere forces us as meteorologists to give our prime attention to the fundamental mechanics of the atmosphere, we shall have reason to congratulate ourselves on the conditions that have made its publication possible. May we not adopt the enthusiastic words of the immortal Kepler, in his "Harmonies of the World," "The die is cast! The book is written! It can well afford to wait a century for a reader, since God has waited 6,000 years for the astronomer."—[C. A.]

WINSLOW UPTON, 1853-1914.

We regret to note the death of Prof. Winslow Upton, on January 8, in the sixty-first year of his age. He will be remembered by many in the Weather Bureau as an active member of the "Study Room" established by Gen. W. B. Hazen, as Chief Signal Officer, in January, 1881. Although Professor Upton was with us only a few years, yet his activity and his extensive knowledge contributed greatly to the usefulness of this official effort to introduce a higher scientific standard into the work of the Weather Bureau. When President Garfield appointed General Hazen the Chief Signal Officer, intrusted with the conduct of the Weather Bureau, the latter was urged by the lamented President "to give the right hand of fellowship to science as such." It was in obedience to this advice that Winslow Upton was drawn from the Naval Observatory into the Weather Bureau of the Signal Office. In 1884 he was appointed professor of astronomy at Brown University, and within a few years supervised the construction of the Ladd Observatory, where regular meteorological observations have been kept up. Upton was one of the organizers of the New England Meteorological Society in June, 1884, and most active early contributors to its bulletins. This society was supported by such eminent men as W. H. Niles, W. M. Davis, D. Fitzgerald, E. B. Weston, W. Upton, A. Lawrence Rotch, M. W. Harrington. It also exerted a decided influence in favor of the appointment of M. W. Harrington on July 1, 1891, as the first Chief of the Weather Bureau under its new scientific organization. A similar "Ohio State Meteorological Bureau" had been established April 17, 1882, by action of the State Legislature and attained great usefulness under T. C. Mendenhall as the active president of the board of directors, he being also at that time professor of physics in the State University at Columbus. In those days, under the wise administration of Gen. W. B. Hazen, great interest was manifested in the organization of independent State weather services throughout the country. (See Annual Report of Chief Signal Officer for 1881, pp. 71-72.) But this was soon transmuted into the establishment of State services under the conduct of Weather Bureau officials, and the support of the Chief Signal Officer. The stimulus given to intellectual activity by the establishment of independent services may possibly break up the quiet and homogeneity of routine climatological work, but it does far more good than harm by stimulating every man to see if he can possibly improve on what has gone before. As these independent State services have now almost entirely disappeared and are almost forgotten because merged with the general Weather Bureau official system, we have thought it important to dwell upon Professor Upton's activity in this early organization and his thorough sympathy with the desire to stimulate independent thought. The degree of Ph. D. in the German and in many American universities must be accompanied by a thesis in which the candidate illustrates his own adaptability or power of original investigation, and Prof. Upton's life gave many such evidences of his own gifts, both in astronomy and meteorology.—[C. A.]

THE DRIFT OF A TRAIN OF A BRIGHT METEOR.

Almost the only information that we can obtain with regard to the motions of the highest portions of our atmosphere comes from observing and studying the slow drift of the delicate train of light or luminous dust left behind when a bright meteor passes through the upper air.

The following note from Mr. Frise, of Sheridan, Wyo., shows that the meteor train observed by him January 12 drifted rapidly eastward as its particles settled toward the earth. We should have gained much exact knowledge from this meteor if only observers at other stations could have made records of its appearances as seen by them, but certainly we are authorized to conclude that a strong easterly wind, or possibly from the west by south, must have been prevailing in the upper atmosphere at that time. Prof. C. C. Trowbridge, of Columbia University, calls attention to the value of the information that may be obtained from the phenomena of meteor trains.

Photographic apparatus appropriate to the prompt record of such meteor phenomena has long since been designed and will, it is hoped, become available to observers during the coming year.—[C. A.]

LOCAL OFFICE, U. S. WEATHER BUREAU,
Sheridan, Wyo., Jan. 14, 1914.

As the regular evening observation was being made on the 12th instant my attention was attracted to an optical phenomenon in the west unlike any before observed. No instrument was available for determining the true position, but the desire to locate as accurately as might be done by eye observation came to me at once, so that with the care which that desire prompted, the estimated position is not much in error. The altitude was about 12° to 15° and azimuth about 75°. It was first observed at 5:45 p. m. local time (105th Mer.), and at 6:05 p. m. it was very faint and disappeared at 6:07 p. m. It was apparently a chain of stars about 6° to 10° in length in

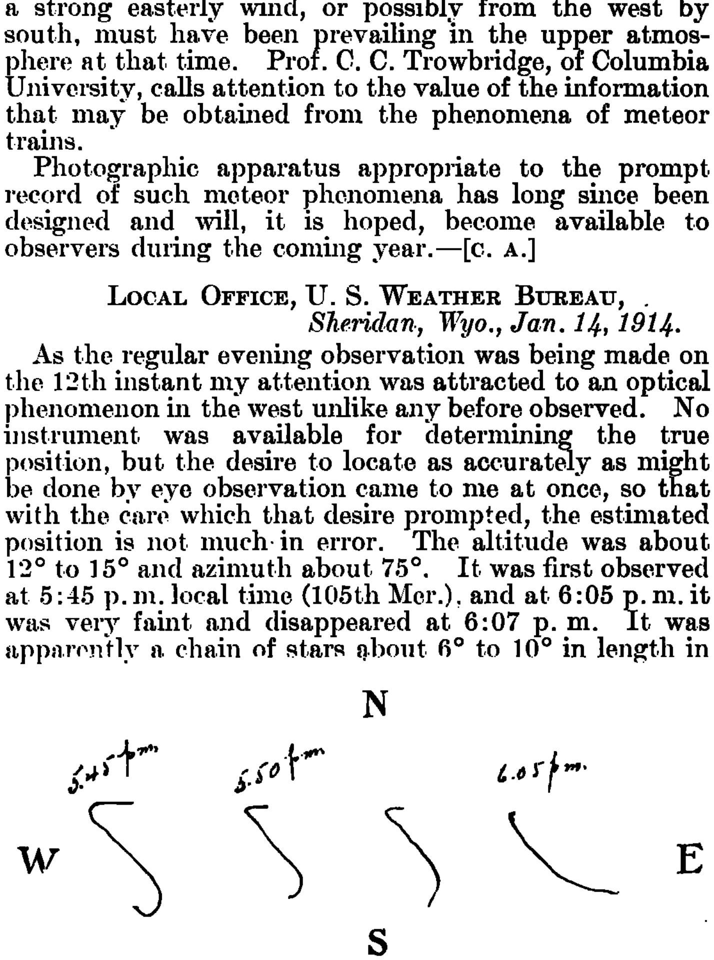

FIG. 1.—Train of meteor at Sheridan, Wyo., Jan. 12, 1914. Appearance of train at 5:45 p. m., 5:50 p. m., and 6:05 p. m.

the form of an imperfect letter *S*, closely resembling the figures accompanying which were drawn as the observation was made. It [the trail] was nearly upright when first seen, but as it shortened and straightened it resembled a shepherd's crook or staff by the time it had become so faint as to be scarcely discernable.

Its light was identical with that of a bright star, no color appearing at any time. With the diminishing brightness of the light it seemed to rise slightly and the lower portion at times seemed to draw up so as to shorten the figure. Whether this was due to actual motion or to an unsteady medium through which its light came was not apparent. But that the shape of the figure was